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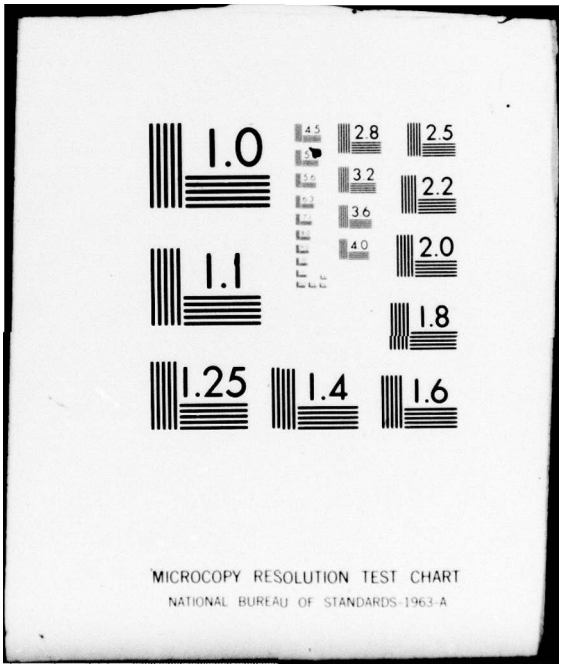
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FOREIGN TECHNOLOGY DIVISION

DISTURBANCE CAUSED BY THE FALL OF A SATELLITE

By

Hsieh Ch'u

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Disturbance Caused by the Fall of a Satellite

By
Hsieh Ch'u

In the wintry wildness of the Canadian Northwest Territories, a patrol car of the Royal Canadian Mounted Police was suddenly braked to a halt, and from the car jumped two policemen. With great surprise, they stared at a spectacular scene in the sky. The day had not broken yet. In the darkness before dawn, a dazzling fiery ball, trailed by a number of little burning pieces, rushed down and disappeared in the cold wildness.

"Really strange. It does not look like an aircraft accident, nor a shooting star. What is it?" said the panting officer Dale Macleod.

That was the scene of the crash of a Soviet spy satellite in Canada. The satellite was named Cosmos 954 and it carried a small nuclear reactor with it. It was 6:53 in the morning on January 24, 1978 when the satellite crashed.

There were several others who witnessed the crash of the satellite. The location where the incident took place is near by the Great Slave Lake. Along the lake there is a small gold-mining town named Yellowknife, and the population of the town is no more than ten-thousand. Marie Ruman, a night janitor in an office building in Yellowknife, said, "I saw something on fire coming down from the sky and it was followed by several tens of little burning pieces, which then fell one after the other. Each of them had a little tail and they made no sound."

From the accounts of different witnesses, it became known that the

satellite evidently fell at a place about 180 kilometers east of Yellowknife. Under the impact of the strong wind and the Arctic coldness, there grows no plant in this area except for some small and short pine trees, which are all no thicker than a finger. Nevertheless, rocks are plentiful and lakes numerous. In the summer time, people often come to fish sturgeon in the lakes. But in winter, the temperature is always 40° below zero, so there is nothing but ice everywhere.

At 7:15 in that morning, in the premier's mansion by the Ottawa River in the Canadian capital, abruptly the telephone began to ring. Premier Trudeau went to answer the phone and realized that at the other end was President Carter's voice. From the information collected by the Space Defense Center of the North America Air Defense Command, Carter had learned the satellite had crashed somewhere in Canada, so he wanted to inform Trudeau immediately by telephone and suggested that he would like to send a group of American military technicians to help to locate the wreckage. By this time, Trudeau had not yet received any report from his own country.

Soon after a report had reached Ottawa by those who witnessed the incident and the crash of a satellite was confirmed, a searching team named as "Operation Morning Light" was immediately put into action.

An Ailing Spy Satellite Discovered

How the incident had happened? We should look back to it before going into details of the efforts in trying to locate the wreckage of the crashed satellite.

There is a Cheyenne Mountain in the State of Colorado, and the mountain is an accumulation of pink granites. Underneath the mountain at a depth of about half a kilometer, there is the headquarters of the North America Air Defense Command, which is responsible for commanding and directing the activites of air defense in the United States. In that underground castle which is isolated from the rest of the outside world, there is a room which is measured ten by ten meters. In the room, there are control stands with television screen on each of them, and large display boards on the walls. This undreground room painted light green is the Space Defense Center of the North America Air Defense Command. The instruments and equipment here work twenty-four hours a day unblinkingly to watch the activities in space. It is the heart of the US space tracking operation.

On September 18 of last year, the blue-uniformed technicians in this underground Center discovered a new spy satellite which had been sent into orbit from a Soviet space launching site. The satellite was Cosmos 954.

How did they discover it? For watching the activities at the Soviet space launching sites at Tyuratam, Kapustin Yar and Plesetsk, the United States has developed a system of pre-monitoring satellites, and also set up eavesdropping devices around the Soviet territories. Those devices are used to detect the movement or the launching of Soviet satellites by measuring the changes of seismic wave and atmospheric pressure by means of radio, radar or sonar. A network consisting of 30 space monitoring stations in various places throughout the world has been set up by the North America Air Defense Command. Once a satellite was sent into orbit by a

rocket, the network begins to watch the activities of the satellite by using radar and optical tracking devices. The observation data are then sent to an electronic computer in the Space Defense Center. After analysis by the computer, the orbit parameters of the satellite can be known and the accuracy canbe to a degree counted only by second.

What kind of satellite was the Cosmos 954, which had been monitored by the United States and what was its mission? The analysts in the headquarters of the North America Air Defense Command, through comparison of its orbit with the orbits of those satellites of which the conditions and missions had been known, determined that it was a Soviet ocean monitoring satellite. The satellite was equipped with a small nuclear reactor used as electricity source for its ocean searching radar. The life span of this kind of satellite is usually 70 days. When its life comes to an end, before it re-enters the atmosphere to be burned up, the reactor would be separated from the satellite and be pushed up by a small thruster to a higher orbit so that the nuclear reactor would not fall back on earth and create radiation disaster. In this case, the nuclear reactor should be sent from the ocean monitoring satellite orbit of about 200 kilometers into a higher orbit of about 1,000 kilometers, where the reactor could remain for several hundreds to more than ten-thousand years. And the other parts of the satellite would soon fall back to the atmosphere and be burned up.

But, as of early December,this Soviet satellite had completed its mission and the reactor should be separated off, but for some reason, it failed to do so. Those Americans who had been watching the movement of this satellite soon realized that the satellite had something wrong. By

the middle December, the ailing Cosmos 954 carrying its nuclear reactor began gradually to drop from its orbit, and it lost altitude by each orbiting. Before long it would re-enter the atmosphere and be burned. On December 18, the North America Air Defense Command sent a report about the possible danger of a Soviet satellite crash to the White House, Pentagon and the CIA.

On January 12, Zbigniew Brzezinski, President Carter's national Security Advisor, called in Soviet Ambassador Anatoly Dobrynin to the White House and told him that according to the calculation of the US electronic computer on the dropping from its orbit of a Soviet satellite, it would be possible that the satellite could fall somewhere in North America. In order to make adequate preparation, the United States wanted the Soviet government gave an explanation of what dangerous equipment this satellite was carrying. Dobrynin himself is a well-known Soviet areodynamicist, and certainly he knows the seriousness of the matter. He promised to give an answer after he had requested his government. In the following day, the Soviet ambassador sent an "ambiguous assurance" but no explanation in detail. The United States two times telephoned the Kremlin and asked for more detailed information. On January 17, Brzezinski once again called in the Soviet ambassador and asked him whether this nuclear-powered satellite would explode like an atomic bomb when it re-enters the atmosphere and touches the earth. The ambassador firmly stated, "It is not a bomb and it will not explode."

Even so, the US government assembled a task force by selecting those who had received the training of preventing nuclear pollution and Air Force personnel who could measure the degree of radiation. They were asked to be ready to be sent to the incident spot at any time. The United States also

sent information to the governments of NATO 14 nations, Japan, Australia and New Zealand.

In the afternoon of January 23, this ailing spy satellite was close to its end. On the display boards in the US underground tracking center, it showed that the orbit of Cosmos 954 was passing the sky over the Australia desert, and from northeast it flew over the Pacific Ocean and re-entered the atmosphere over Canada's Queen Charlotte Island. Without doubt, it would be crashed somewhere in Canada. In the very early morning of January 24, President Carter's National Security Advisor was waked up and told that the Soviet satellite had finally crashed.

It Wanted to Locate the US Submarine

The searching for the radiative wreckage of the satellite started immediately. More than 100 nuclear scientists, technicians and an emergency team were sent to the spot. The United States sent the high-flying U-2 jet and WC-135 weather observation plane and they all carried radiation detector to check the upper atmosphere for radiation clouds over the area. The Canadian C-130 planes crisscrossed the sky day and night over the desolate Northwest Territories. Each of the planes carried two gamma-ray detectors to search for the radiative debris. Each detector is weighted about 600 kilograms. A Canadian searching team composed of 22-men was sent from Edmonton to Yellowknife. Each of the team members wore radiation-proof suit and mask and they carried Geiger counter with them to check the grade of radiation in the area near by the Great Slave Lake. A 44-men team of American military technicians also arrived from Andrew Air Force Base and

Nellis Air Force Base to help searching for the wreckage. The Soviets at the same time to Canada and the United States expressed "their great interest in taking part in the searching activities". But their request was politely rejected.

There must be good reasons that the United Sates, Canada and the Soviets were so much interested in locating the wreckage. For one thing, they all wanted to prevent the radiation from harming the inhabitants in that area, so they wanted to try to collect all of them. Although the Canadian Northwest Territories are desolate areas, to the nomadic Eskimos, the radiation could be very harmful. There was also important military factor. Cosmos 954 is a unique satellite and its length is 14 meters and its weight is about 5 tons. It has an ocean scanning radar of high resolution It uses a parabolic antenna to watch the vast oceans from the North Pole to the South Pole. Its radio emitter can send all data collected to the Soviet ground station. The Soviets have continuously tried to improve the ability of this kind of satellite to monitor the activities of ocean ships, and they especially wanted to track the US deep-sea nuclear submarines. According to some speculation, the methods which the Soviets used are to develop a radar which can sensitively sense the changes of life rules of the planktons on the surface of the sea. Such changes are mostl caused by the movement of deep-sea submarines. So, if there are some changes of the life rules of the planktons, there must some movements of a submarine. The movement of a US submarine, which previously cannot be tracked, can thereby be easily exposed. This kind of radar of high resolution needs greater power supplies, so the Russians chose to use nuclear reactor to generate electricity.

The tracking center of the North America Air Defense Command underneath the deep granites of the Cheyenne Mountain is watching the activities of the Soviet satellites in ... space.

The crash of this Soviet satellite provided a very good opportunity for the intelligence organizations in the United States and its west allies. The military technicians in the United States and Canada hoped to be able to know how well the Soviet ocean monitoring techniques have been developed through the analysis of the wreckage of this satellite.

What were the outcomes of the searching? Barnett Danson, Canadian National Defense Minister,on April 4, announced that Canada had spent 600 million Canadian dollars in a period of two months and that the search for wreckage of the Soviet nuclear-powered spy satellite had been concluded. The result of the search was a basketful of little pieces of radiative metal falling out from the satellite. He continued to say that these materials would suffice to constitute a legal basis for Canada to ask the Soviets to compensate the damages caused by the radiation of their satellite wreckage. However, there seemed to be no way to compensate the damage made by the

raditation on people's health in that area. The Canadian Foreign Affairs Minstry had notified the Soviet authorities that Canada would send them a list of the expenses for searching activities and the environment damages caused by the radiation.

Danger Still Existing

The climax of the drama of a satellite crash has been over. But this incident has once again showed to peoples throughout the world that the armament race between the United States and the Soviets would bring threat and disaster to the lives of common people. Some experts had pointed out that it was really a luck that the satellite had fallen in that wildness. If the satellite had flew one more cycle in the space, it would have dropped in New York City and its dropping time would be the morning rush hour.

The Time magazine pointed out that Cosmos 954 carried a nuclear reactor which contianed highly enriched uranium of 49 kilograms. Its power is about 100,000 tons of TNT, five times the explosive power of the atomic bomb dropped on Hiroshima in Japan at the end of World War II. Although it was said that it would not explode when it re-enters the atmosphere, if all the radiation of this satellite fell onto New York, the destruction could extend to an area of more than six acres. The magazine also indicated that during its falling, the gasified uranium 235 and other particles of Cosmos 954 had formed a piece of radiative cloud in the atmosphere and the cloud extended 40 kilometers long and was floating eastward.

In France, Aviation and Cosmos, a journal, pointed out that the uranium 235 nuclear reactor of Cosmos 945 was weighted 508 kilograms, and

its overall diameter was 2.28 meters, and it core diameter was 0.6 meters. Its fuel was uranium dicarbonide. weighted 49 kilograms and its working temperature was 1,170°C. Using 2% power by Si-Ge couple, it can turn 40 kilowatt of thermal energy into electrical energy and it can supply 500-800 watt of power.

This French journal continued to say that it is nothing new that a satellite or its fragments re-entered the atmosphere and dropped to the earth, and it often took place without people's knowing of it. The residents in Chicago once picked up a piece of a Soviet satellite wreckage, which was weighted about 10 kilograms. Somewhere in Finland, once dropped some fragments of a Soviet Cosmos satellite. In 1969, a Japanes seaman was injured on the sea by a fragment of a Soviet satellite.

The incident of dropping small nuclear powered unit from the space in Canada was not the first time. In 1969, two Soviet moon probes, which were equipped with nuclear reactor, burned when they returned into atmosphere and spread raditions. In 1973, a nuclear powered Soviet satellite dropped into the Pacific Ocean north of Japan. In 1964, a US navy satellite, which carried a nuclear reactor, failed in launching and burned over the Indian Ocean and its radiation spread widely. In 1968, A US meteorological satellite failed in launching and its Pu-238 fuel tank dropped into Saint Barbara strait and was completely recovered. In 1970, the US Apollo 13 developed problems in its way returning to earth and its Pu-238 fuel tank dropped into the Pacific Ocean and was never recovered.

Soviet and U.S. space incidents are causing public anxiety and protests. Crowds of Canadians assembled in front of the Soviet consulate in Montreal and held demonstrations to protest the crash of the Soviet nuclear satellite in Canada. The U.S. "Newsweek" magazine quotes a retired San Francisco postal worker who said, "The worst part is knowing this kind of thing can happen. It makes you realize that one of these things could fall and hit you at any time." Many Americans are opposed to the American government being in cahoots with the Soviet Union and are expressing strong dissatisfaction that the news about the crash of the nuclear satellite was concealed from the public for so long. Henry Kender, an M.I.T. physics professor protested, saying: "We have every right and need to know what things are in flight that might eventually fall on us as well as needing to know when they become defective."

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